Town of Amherst
Greenhouse Gas Inventory Report

Prepared by: Taylor Briglio

Carbon Footprint Analysis and Communication Intern

Prepared August, 2017

Executive Summary

The Town of Amherst (Amherst), Massachusetts has a progressive attitude towards the environment and its environmental impact. Amherst prides itself in maintaining the natural environment and actively works to preserve open space from future development. The town completed greenhouse gas emission inventories in 1997 and 2005, but they are now outdated and no longer useful for community planning. The town has since engaged in several energy efficiency projects and wants to take a closer look at its current greenhouse gas emissions.

In the base year, FY 2011, Amherst emitted 293,538 metric tons of CO_2 equivalent ($MTCO_2e$). In FY 2016 the towns emissions decreased by 2.3% to 286,773 $MTCO_2e$. In FY 2016, Amherst's greenhouse gas emissions were 7.2 tonnes per capita, 66% lower than the 2014 United States emission rate of 21.3 tonnes per capita (USEPA 2014). Main emission sources were similar during both inventory years. The stationary energy and transportation sectors are the two largest emission sources, comprising over 97% of total emissions in both inventory periods (Figure 1 and Figure 2). Emission from Waste and Agriculture comprise the remaining 3% of emissions. Amherst does not contain a significant amount of Industrial Processes; therefore, that sector was excluded from the inventory.

During both inventory periods, the three universities, University of Massachusetts Amherst, Amherst College, and Hampshire College[1] account for nearly 50% of the town's emissions (Figure 3 and Figure 4). University of Massachusetts Amherst alone accounts for over 40% of the town's emissions. The majority of the remaining emissions come from residential buildings and other community sources. Fugitive emissions from the conveyance of natural gas are modelled using general assumptions and are not an attempt to quantify emissions from leaks specifically within Amherst.

Emissions from municipal operations account for less than 2% of total emissions. The town has made a conscious effort to reduce its energy usage over the past several years and as a result municipal operations decreased by 21.4% from 5,583 $MTCO_2e$ in FY 2011 to 4,289 $MTCO_2e$ in FY 2016.

Amherst has not set a formal GHG reduction goal at this time. This inventory will be used by Town staff and other stakeholders to develop a climate action plan, set emission target goals, and serve as a catalyst for other sustainability issues within the town. Amherst intends regularly monitor their emissions to measure the impact of their sustainability initiatives.

Town of Amherst- Community FY 2011 Greenhouse Gas Emissions Inventory

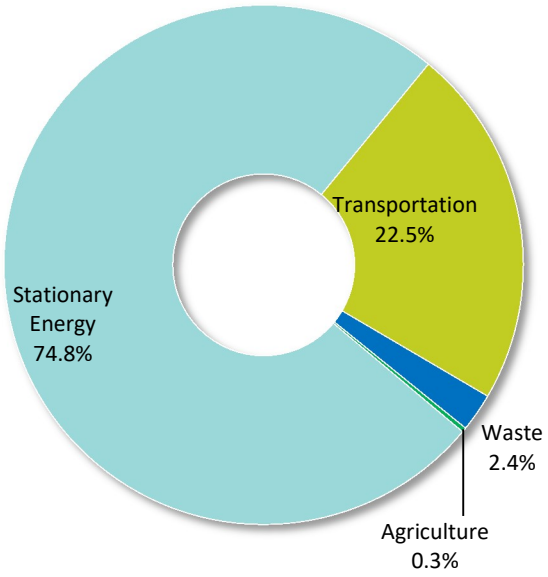

Figure 1. Percentage of Amherst's FY 2011 greenhouse gas emissions summary by sector.

1. Only a limited amount of data could be gathered from Hampshire college; therefore, the university's emissions may be underestimated

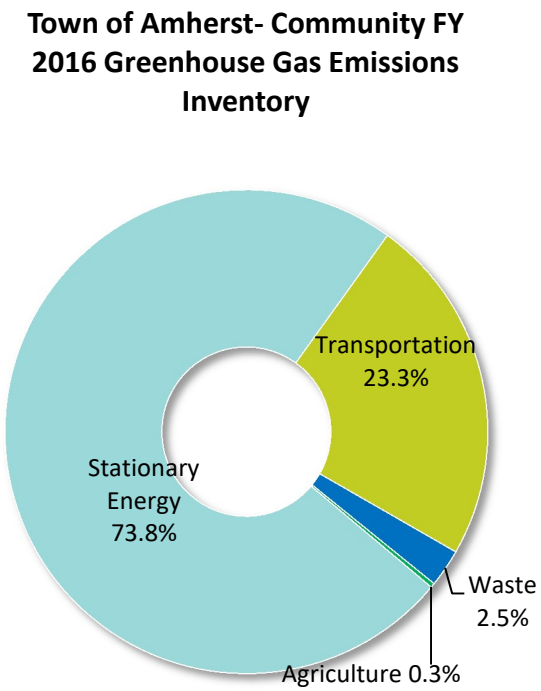

Figure 2. Percentage of Amherst's FY 2016 greenhouse gas emissions summary by sector.

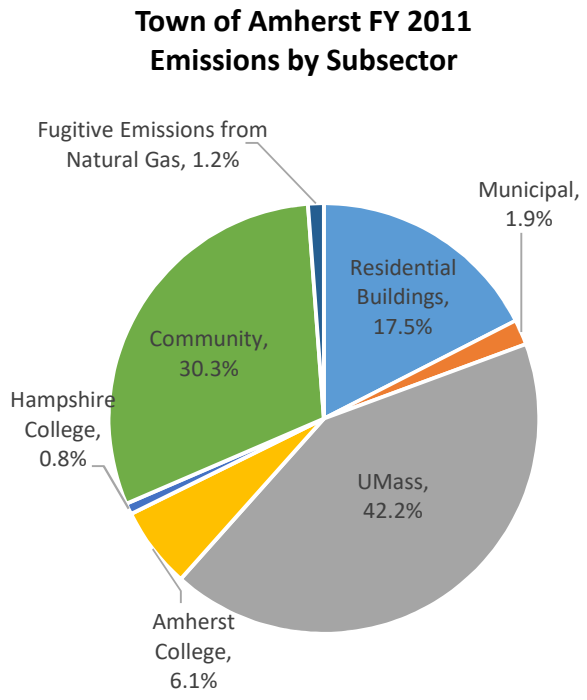

Figure 3. Percentage of Amherst greenhouse gas emissions by subsector in FY 2011.

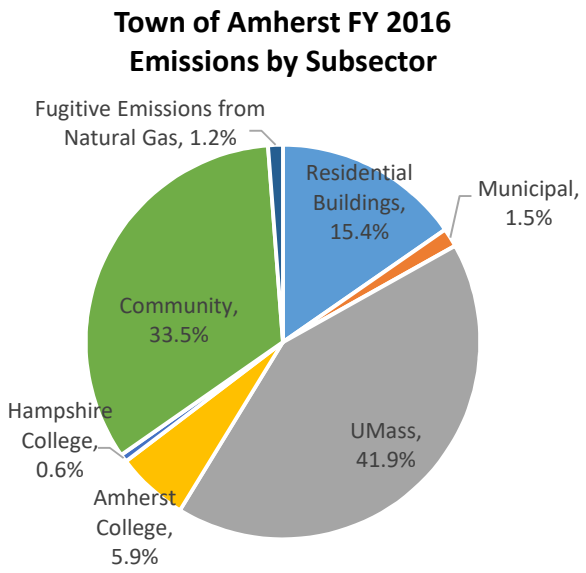

Figure 4. Percentage of Amherst greenhouse gas emissions by subsector in FY 2016.

Introduction

City Background

Amherst is located in eastern portion of Hampshire County. As of 2016, Amherst's population is approximately 40,079, the largest in the county. The town's main economic sectors include educational services, retail operations, and agriculture. Amherst is home to three universities: University of Massachusetts Amherst, Amherst College, and Hampshire College. The universities have a significant impact on the town in regards to its population dynamics, employment, and environmental mindedness. Modest population growth is expected in the town in the coming decades.

At the time of this inventory, Amherst has not set a greenhouse gas emission reduction goal, but the town has actively worked to reduce its energy usage and carbon footprint. The town recently retrofitted all of the town-owned streetlights with LED lights and sponsored a solar panel campaign that resulted in adding solar photovoltaics to nearly 200 homes. As equipment requires replacement, the town installs high efficiency motors and boilers. Lastly,

several municipal departments have actively switched away from heating oil to natural gas. While not implemented at the time of the inventory, Amherst is working on a bike share program and local renewable energy projects.

Background and Objective

Amherst previously completed two greenhouse gas inventories, one in 1997 and one in 2005. In 2017, these inventories are outdated and no longer useful for planning. Both of the previous inventories were smaller in scope that the FY 2011 and FY 2016 inventories. The purpose of the new inventories is to establish a new, comprehensive baseline and see how recent town actions have impacted emissions. The inventories are intended to provide a detailed look of emission sources within the town to help town staff target sectors that have the highest opportunity to reduce emissions. Amherst also plans to do more regular emissions monitoring to better track and analyze the impact of its sustainability projects.

Inventories and Base Year

Community Inventory

The community GHG inventory represents total emissions from activities that occur within the geographic borders of town. Emissions are determined on a fiscal year basis (July 1-June 30) which aligns with the schedule many data sources operate on including municipal operations and each of the universities. The community inventory includes four main emission sectors: stationary energy, transportation, waste, and agriculture. Amherst does not contain major industrial processes; therefore, that sector was excluded from the inventory.

Municipal Inventory

The municipal inventory represents a subset of the community inventory. The municipal inventory calculates the emissions associated with all municipal operations including building energy usage, vehicle fleet fuel usage, and other miscellaneous operations. It was not possible to determine emissions from waste generation from to municipal activities. Emissions from waste generation are calculated in the community inventory. The municipal inventory allows the town to take a closer look at its operations and find opportunities to reduce its environmental impact.

Base Year

A base year provides a snapshot of the community's emission and a reference point to set reduction goals, predict future emissions, and to track progress. Attention should also be given to selecting a base year that represents "normal" conditions within the community. For example, a particularly hot summer or cold winter could skew the base year inventory results, distorting emissions forecasts. Base years should also represent the most complete data set available. This can prove challenging depending on the regularity with which underlying emissions data is collected or modeled for the various sectors. Some data sets are often reported annually, such as utility consumption, while others are generated less frequently, such as regional transportation models.

Based on data availability, FY 2011 was selected as the base year for both the community and municipal operations inventories.

Methods

The municipal operations inventory was completed using guidance provided in *the Local Government Operations Protocol* (LGOP). Emissions are categorized by individual town department. The community inventory was completed using guidance provided in *Global Protocol for Community Scale Greenhouse Gas Emission Inventories* (GCP). Emissions were categorized by sector and subsector described in the protocol. Commercial and institutional subsector emissions were further categorized (when possible) into UMass, Amherst College, Hampshire College, Municipal, and

Community emissions. Greenhouse gas emissions are converted to equivalent carbon dioxide emissions based on a gas's 100 year global warming potentials reported in IPCC's 5th Assessment Report.

Community Emissions Summary

Stationary Energy

Stationary energy is the largest source of Amherst's emissions, in both inventory years. 219,654 $MTCO_2e$ were emitted from stationary sources in FY 2011. Stationary energy emissions decreased by 3.6% to 211,716 $MTCO_2e$ in FY 2016. Natural gas and electricity are two largest sources of energy in the Town (Figure 5). The largest natural gas user is UMass, in particular because of the combined heat and power (CHP) plant on the campus (Figure 6). The CHP plant is run primarily on natural gas, but may also be run on liquefied natural gas and ultra-low sulfur diesel. The CHP provides most of the electricity for the campus, which explains the campus's proportionately smaller electricity usage.

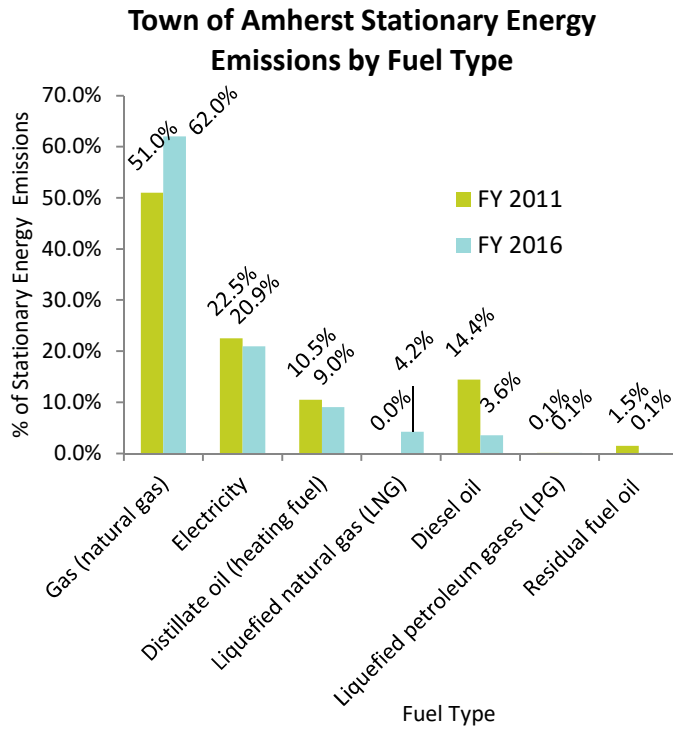

Figure 5. Amherst's stationary energy greenhouse gas emissions during FY 2011 (green) and FY 2016 (blue).

Residential buildings and the non-university community usage consistently combine to be the largest electricity users (Figure 7 and Figure 8). Residential electricity usage decreased by 14.5% between FY 2011 and FY 2016 while commercial and industrial electricity usage (includes the universities) increased by 22.1% during the same time period. Total electricity usage increased by 3.8% between FY 2011 and FY 2016; however, electricity related emissions decreased by 10.8% during the same time period. The increase in electricity usage was offset by the decrease in the carbon intensity and transmission losses of the electricity during this time period. Both heating oil and diesel oil usage decreased between FY 2011 and FY 2016 while natural gas usage increased during the same time period increased. This suggests that Amherst is switching away from the most carbon-intensive fuels.

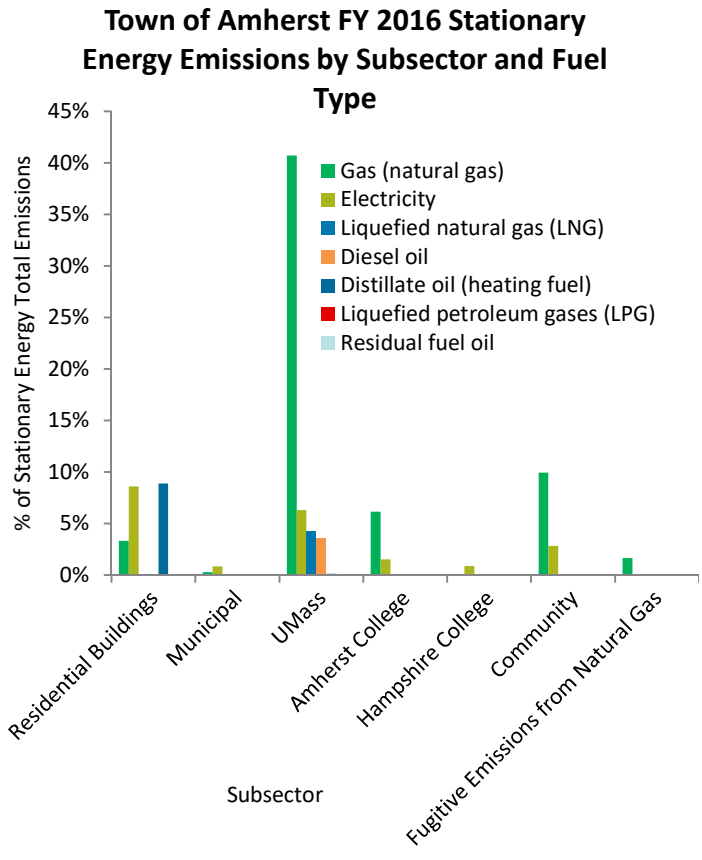

Figure 6. Percentage of Amherst's stationary energy greenhouse gas emissions by fuel type and subsector in FY 2016.

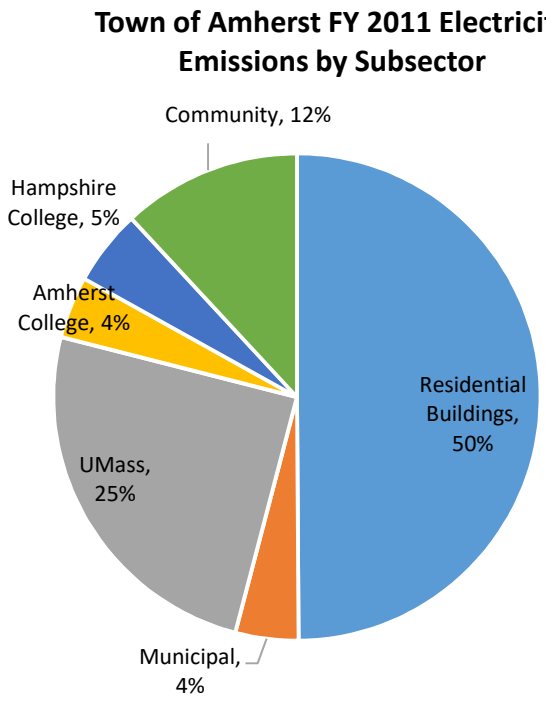

Figure 7. Percentage of Amherst's electricity greenhouse gas emissions by subsector in FY 2011.

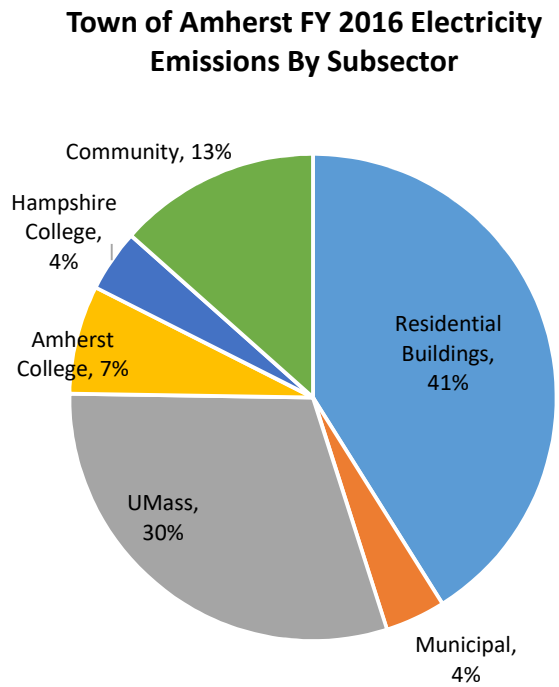

Figure 8. Percentage of Amherst's electricity greenhouse gas emissions by subsector in FY 2016.

Transportation

Transportation is the next largest source of Amherst's emissions. 66,047 $MTCO_2e$ were emitted from mobile sources in FY 2011. Transportation emissions increased by 1.4% to 66,944 $MTCO_2e$ in FY 2016. The vast majority of transportation related emissions come from on-road transportation (Figure 9). On-road emissions increased by 5.1% from 56,660 $MTCO_2e$ in FY 2011 to 59,532 $MTCO_2e$ in FY 2016). Over 90% of the on-road emissions come from passenger vehicles (Figure 10). On road transportation emissions consist of emissions from the total number of vehicle miles travelled (VMT) from passenger within the town and emissions from public buses. Each university tracks its own fuel usages, though data could not be obtained from Hampshire College. While not depicted, in FY 2016 UMass's fleet emitted 3.7% of the on-road transportation emissions and Amherst College's fleet emitted 0.5% of the on-road transportation emissions. Railways is shown in both figure to illustrate its scale of emissions relative to the other transportation emission sources.

Off-road emissions decreased by 20.8% from 9,363 $MTCO_2e$ in FY 2011 to 7,412 $MTCO_2e$ in FY 2016. The Amtrak Vermonter line used to stop in Amherst, but as of December 2014 the stop was re-routed to Northampton. As a result, railway emissions decreased from 24 $MTCO_2e$ in FY 2011 to 0 in FY 2016. There are no current plans to re-route the Amtrak line back to Amherst; therefore, future railway emissions are expected to stay at 0. Amherst does not have any airports and does not have a significant boating scene; therefore, these subsectors were excluded from the inventory.

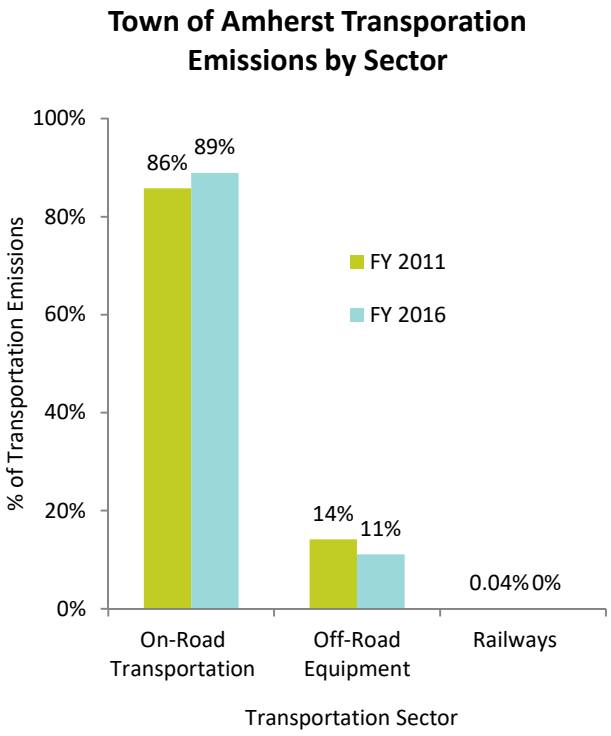

Figure 9. Percentage of Amherst's transportation greenhouse gas emissions by sector in FY 2011 (green) and FY 2016 (blue).

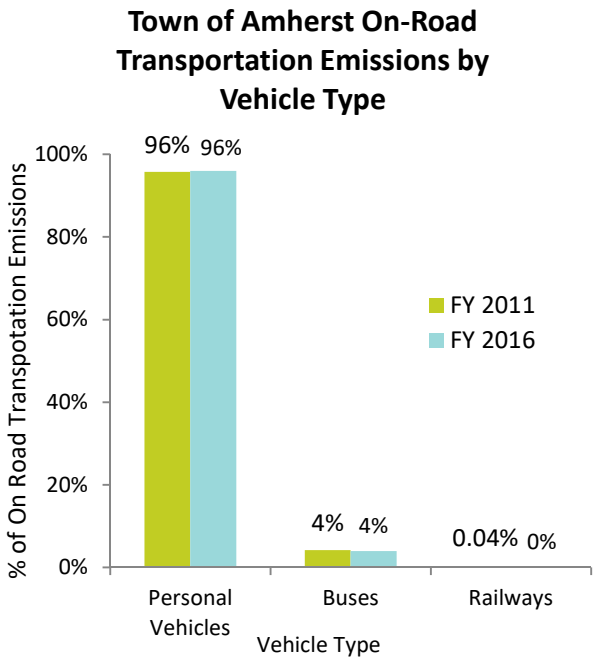

Figure 10. Percentage of Amherst's transportation greenhouse gas emissions by vehicle type in FY 2011 (green) and FY 2016 (blue).

Waste

Emissions from generating municipal solid waste (MSW) and treating wastewater are the third largest source of Amherst's emissions. Total waste emissions increased by 3.9% from 6,994 MT CO_2e in FY 2011 to 7,270 $MTCO_2e$ in FY 2016. The distribution of waste emissions has remained relatively constant between FY 2011 and FY 2016 (Figure 11). Residential and commercial MSW is picked up by several waste haulers and brought to several transfer stations. The transfer stations then send the waste to various recycling, landfill, and incineration facilities. Due to the complexity in the town's waste management system, non-university MSW emissions are modelled using statewide data. Based on statewide averages, the majority of Amherst's waste emissions come from landfilling and incinerating its waste. Each university manages its waste separately from the rest of the town, though data could not be obtained from Hampshire College. UMass and Amherst College both have higher recycling and composting rates than the rest of the state. It should be noted that recycled materials do not decompose into methane and are not combusted; therefore, for the purposes of this inventory recycled materials do not result in greenhouse gas emissions.

Amherst has its own wastewater treatment plant to treat all of the wastewater generated within the town, and some septic systems in neighboring towns. The treatment plant is a centralized aerobic wastewater treatment plant with nitrification and denitrification. Because the system is aerobic, no methane is expected to be generated from the treated wastewater. Nitrous oxide (N_2O) is the only greenhouse gas emitted from Amherst's wastewater treatment process. Amherst upgraded the treatment plant in 2012 to enhance the nitrogen removal and emissions decreased by over 50% from 282 $MTCO_2e$ in FY 2011 to 139 $MTCO_2e$ in FY 2016 as a result.

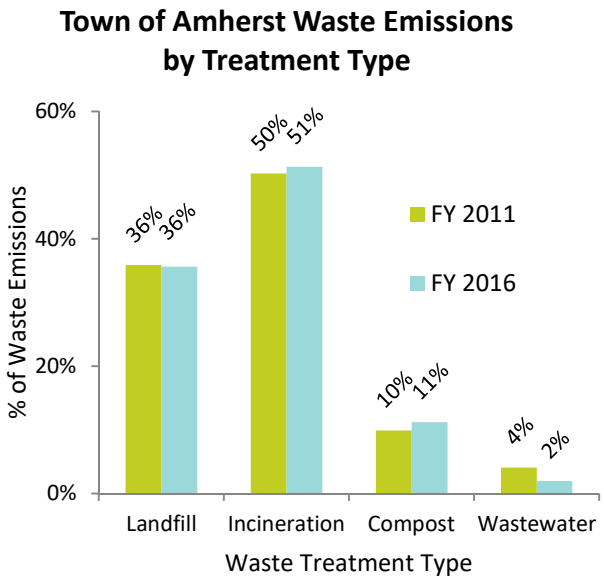

Figure 11. Percentage of Amherst's waste greenhouse gas emissions by vehicle type in FY 2011 (green) and FY 2016 (blue).

Agriculture, Forestry, and Other Land Use

Emissions from agriculture, forestry, and other land use (AFOLU) represent the smallest source of emissions in Amherst. Agricultural emissions remained constant at 842 $MTCO_2e$ during both inventory periods. Agriculture is a vital part of the community and has gained attention as a critical component of greenhouse gas emissions. Livestock, particularly cattle, are generally the largest source of agricultural emissions. Amherst has a relatively small cattle population; therefore, Amherst's agricultural activities do not heavily contribute to the town's emissions. Even though Amherst's AFOLU emissions are relatively small, livestock emissions still account for nearly two-thirds of the agricultural emissions (Figure 12). Cattle then account for 89% of Amherst's livestock emissions (Figure 13). Aggregate sources consist primarily of fertilizer usage and manure deposited in pastureland and rangeland. Land use change is a component of this sector, but was excluded due to a difficulty in obtaining quality data on how the town's landscape may have changed between FY 2011 and FY 2016.

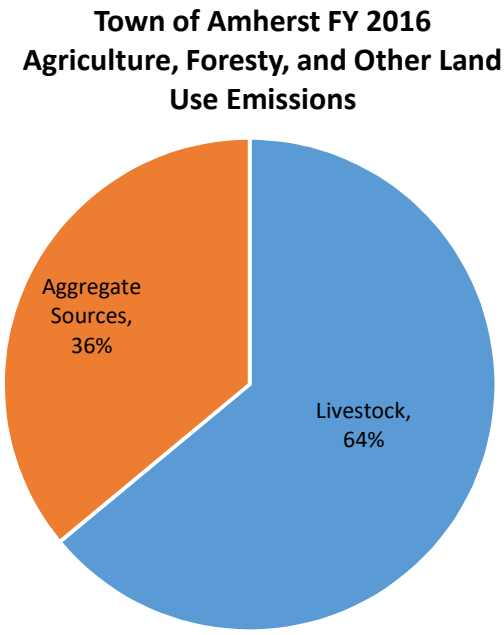

Figure 12. Percentage of Amherst's AFLOU greenhouse gas emissions by sector.

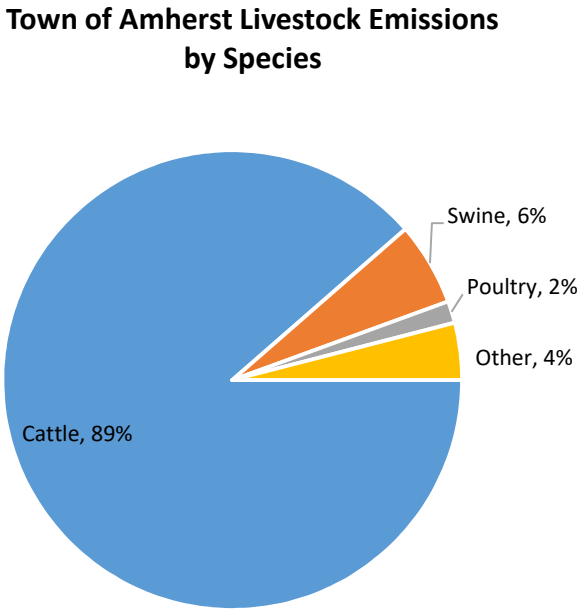

Figure 13. Percentage of Amherst's livestock greenhouse gas emissions by species.

Community Forecasts

Two forecast scenarios were generated during the inventory: a business as usual (BAU) scenario and adjusted business as usual (ABAU) scenario (Figure 14 and Figure 15). The BAU scenario assumes that no additional federal, state, or local actions are taken to reduce greenhouse gas emissions. In general, emissions are expected to increase as population and employment increases. The initial emissions decrease is due to existing vehicle fuel efficiency standards. The standards can offset the expected increase in VMT as well as emission increases from other sectors. As VMT continues to rise, transportation emissions are expected to eventually increase by 2050. The BAU forecast predicts that the town's emissions will increase by 3.1% to 295,753 $MTCO_2e$ in 2050, relative to FY 2016 emissions. The ABAU scenario assumes a much more aggressive approach to reducing emissions including a greener electricity source and assuming that each university reduces their emissions to 0 by 2050. UMass has set a goal to be carbon neutral by 2050. Hampshire College has set a goal to be carbon neutral by 2032. The ABAU forecast assumes that both universities achieve their goals. Amherst College has not formally set a greenhouse gas reduction goal, but it is reasonable to assume that the college will set a similar carbon neutrality goal by 2050. Massachusetts's renewable portfolio standard requires the percentage of electricity generated from renewables to increase by 1% per year. While not a perfect estimation, the ABAU forecast assumes the carbon intensity of electricity decreases by 1% per year to account for the greater share of renewables. The ABAU forecasts demonstrate that with aggressive greenhouse gas management, the Town of Amherst can reduce its FY 2016 greenhouse gas emissions by more than 50%, down to 133,123 $MTCO_2e$, by 2050. Transportation emissions are difficult to project beyond the fuel efficiency standards, so transportation forecasts between the two scenarios are very similar.

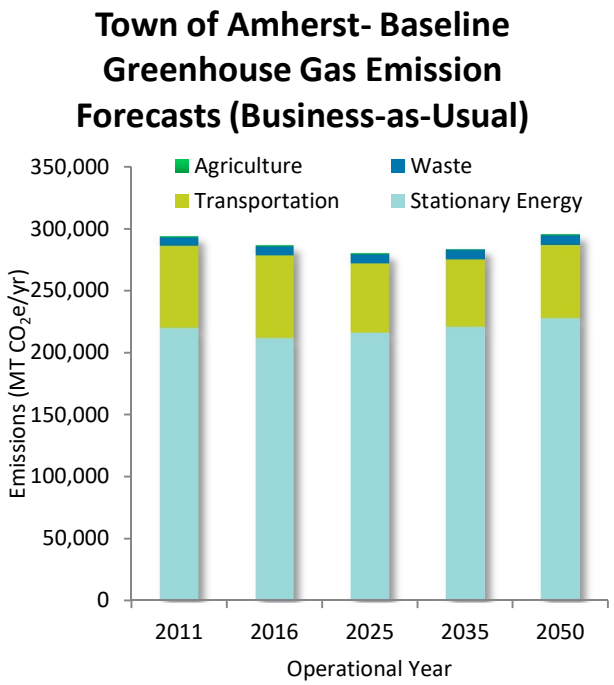

Figure 14. Amherst business-as-usual greenhouse gas emission projections through 2050.

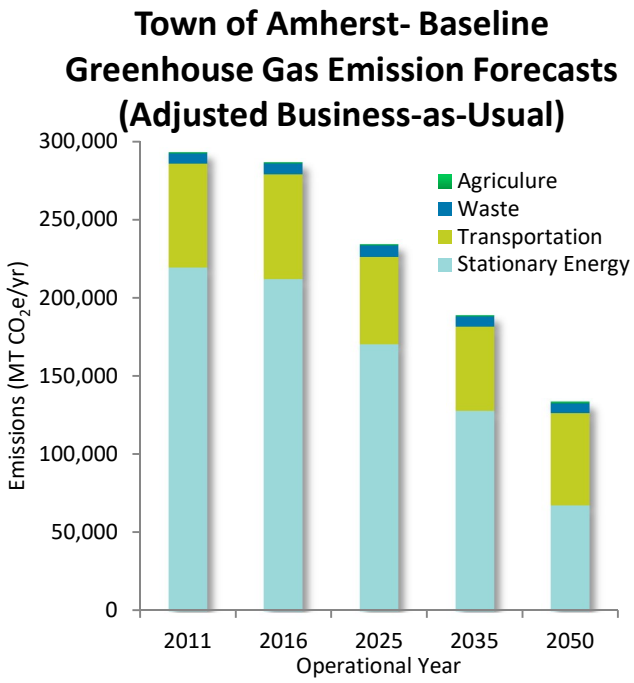

Figure 15. Amherst adjusted business-as-usual greenhouse gas emission projections through 2050.

Municipal Emissions Summary

The town has actively worked to reduce its environmental impact, particularly with improving the energy efficiency of its operations. Overall, municipal emissions decreased by 21.4% from 5,583 $MTCO_2e$ in FY 2011 to 4,389 $MTCO_2e$ in FY 2016. The largest source of emissions within municipal operations has consistently been the energy usage associated with municipal buildings (Figure 16 and Figure 17). The town's efforts to improve building energy efficiency and switch away from carbon intensive fuels is noticeable. Municipal building emissions decreased by 39.4% from 3,710 $MTCO_2e$ in FY 2011 to 2,248 $MTCO_2e$ in FY 2016. The town's vehicle fleet is the second largest source of emissions from municipal operations. Emissions from on-road vehicles have increased by 21.9% from 1,647 $MTCO_2e$ in FY 2011 to 2,008 $MTCO_2e$ in FY 2016. The decrease in building emission combined with the increase in on-road fleet emissions dramatically shifted the distribution of municipal emission sources. On-road fleet emissions now account for nearly half of the municipal emissions. Off-road emissions account for less than 1% of municipal operations and remained relatively constant between the inventory periods. The remaining emissions come from public lighting, other municipal facilities, and fugitive emissions from natural gas transmission and distribution. Like the community inventory, the fugitive natural gas emissions are modelled from state-wide data and may not be fully representative of potential leaks within Amherst. These smaller emission sources collectively decreased by 48.2% from 227 $MTCO_2e$ in FY 2011 to 133 $MTCO_2e$ in FY 2016. Municipal emissions accounted for 1.9% of the town's total emissions in FY 2011 and 1.5% of the town's total emissions in FY 2016.

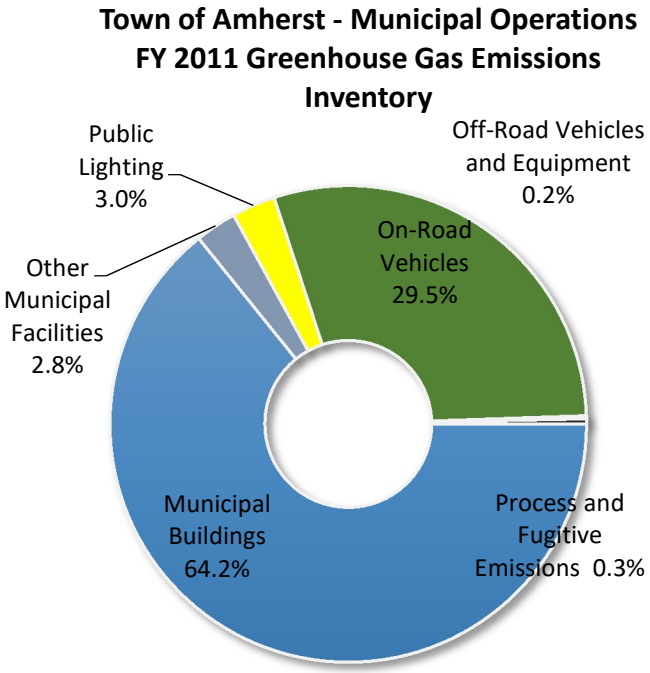

Figure 16. Percentage of Amherst's municipal FY 2011 greenhouse gas emissions summary by sector.

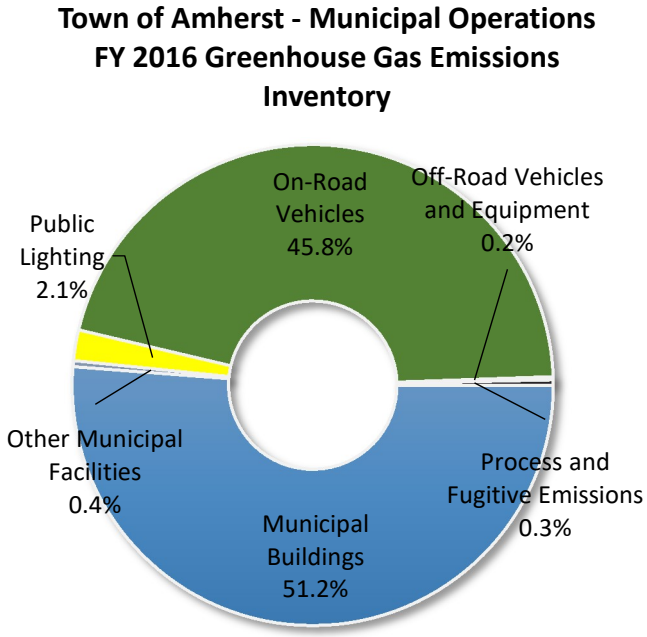

Figure 17. Percentage of Amherst's municipal FY 2016 greenhouse gas emissions summary by sector.

Municipal Buildings

Schools, the water treatment plant, and wastewater treatment plant are the three largest emission sources within municipal buildings. In FY 2016, they collectively account for 65.8% of the municipal building emissions (Figure 18). It should be noted that schools within the municipal operations inventory refer to local and regional elementary, middle, and high schools; not the three universities within Amherst. Schools have high lighting and heating demands. Drinking water treatment and wastewater treatment are both very energy intensive processes, requiring large quantities of electricity. The remaining departments each account for a relatively small percentage of municipal building emissions. While not shown, the general distribution of municipal building emissions between town departments was similar in FY 2011.

FY 2016 Municipal Building Emissions by Department

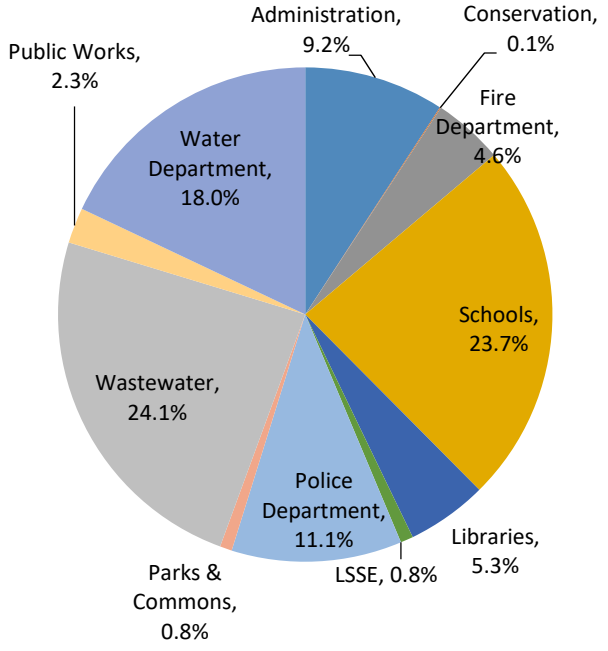

Figure 18. Percentage of Amherst's municipal building greenhouse gas emissions by town department during FY 2016.

The town has dramatically changed its energy mix between FY 2011 and FY 2016. Municipal buildings use three main sources of energy: natural gas, heating oil, and electricity. Heating oil accounted for 34% of the municipal building emissions in FY 2011 and currently accounts for less than 1% of municipal building emissions (Figure 19 and Figure 20). The fire department, libraries, public works, schools, water department, and the wastewater department all formally used heating oil. Currently, only schools still use heating oil, and their usage has decreased dramatically. The overall decrease in heating oil usage is the primary driver in the decrease in municipal building emissions. Similarly to the community inventory, electricity usage for municipal buildings increased by 3.3% between the inventory periods, but the decrease in carbon intensity and transmission loss associated with the electricity still resulted in a net decrease in emissions.

FY 2011 Municipal Building Emissions by Fuel Type and Department

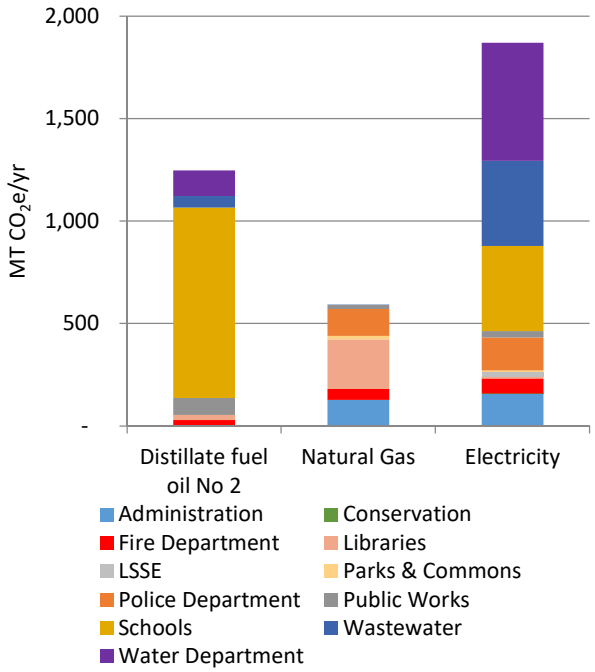

Figure 19. Amherst municipal building greenhouse gas emissions by fuel type and town department in FY 2011.

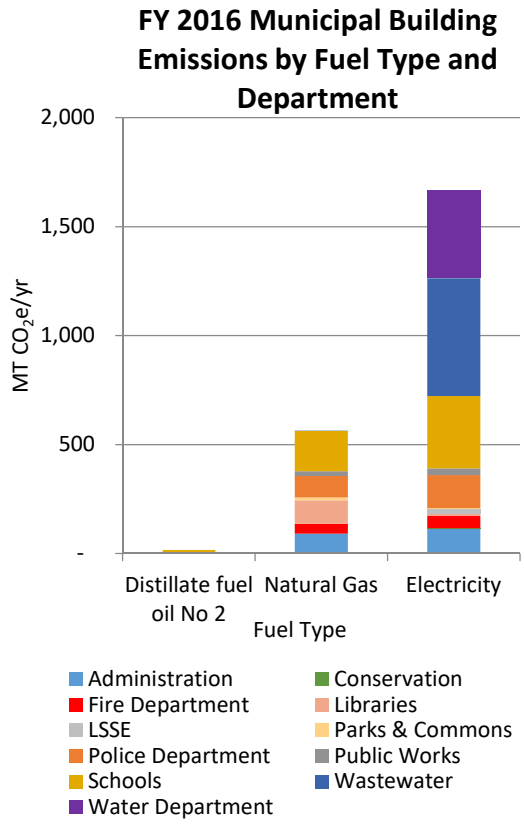

Figure 20. Amherst municipal building greenhouse gas emissions by fuel type and town department in FY 2016.

Municipal Fleet Emissions

Municipal fleet emissions vary significantly through time. Unlike the community inventory, municipal fleet emissions are calculated from empirical fuel usage, as opposed to modelled vehicle miles travelled. During FY 2011, the fire department and public works department were the two largest municipal fleet emissions sources (Figure 21). In FY 2016, schools were the largest emission source, but the public works department and the fire department were the second and third largest sources, respectively. (Figure 22). As mentioned previously, fleet emissions increased between FY 2011 and FY 2016. This is in part because the libraries, LSSE, wastewater, and water departments did not consume gasoline or diesel in FY 2011, but did so in FY 2016.

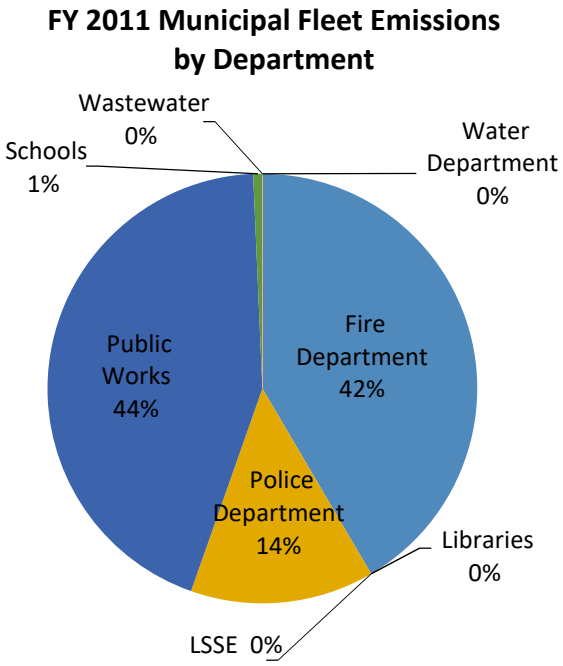

Figure 21. Percentage of Amherst's municipal fleet emissions by department in FY 2011.

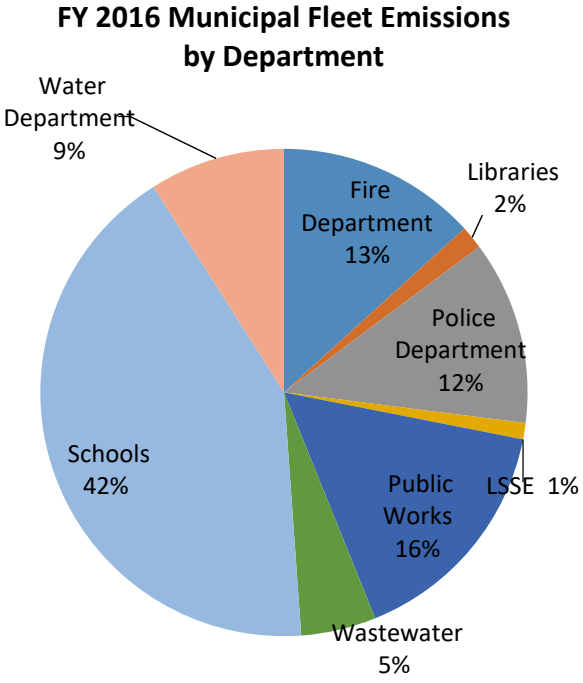

Figure 22. Percentage of Amherst's municipal fleet emissions by department in FY 2016.

Town fleet vehicles run primarily on gasoline and diesel and account for over 99% of fleet emissions (Figure 23). Less than 1% of the fleet emissions come from combusting liquefied petroleum gas, propane. Diesel is largest contributor to fleet emissions, likely used in heavy duty trucks within the different town departments. Fuel usage data does not specify what equipment is used within specific departments. It is possible that some fuel usage could be attributed to other, non-vehicle, equipment (i.e. backup generators). For the purposes of this inventory all gasoline and diesel usage was assumed to be used in on-road vehicles. All propane usage was assumed to be used in off-road equipment.

The town owns some electric vehicles; however, energy usage associated with each vehicle are not tracked. Vehicles are charged at municipal buildings; therefore, there energy usage and associated emissions are accounted for within the municipal buildings subsector. The town expects to continue to purchase electric vehicles as resources permit so the composition of municipal fleet emissions may continue to change over time.

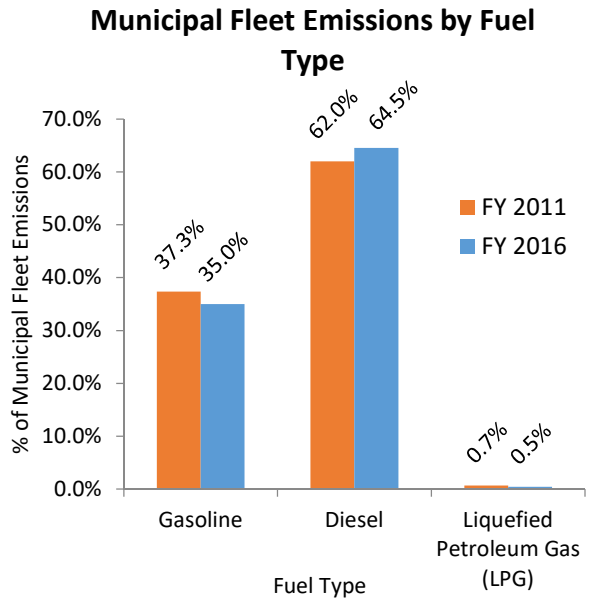

Figure 23. Amherst's municipal greenhouse gas emissions from fleet vehicles by fuel type in FY 2011 (orange) and FY 2016 (blue).

Other Municipal Facilities and Public Lighting

The town provides other public services including free Wi-Fi in the downtown area, metered parking spaces, and public lighting such as streetlights and traffic signals. Electricity is the only energy source associated with other services. Collectively, these other services account for a few percent of the municipal operations. The town completed an LED retrofit of the streetlights and as a result public lighting emissions decreased by 45% from 165 $MTCO_2e$ in FY 2011 to 91 $MTCO_2e$ in FY 2016. Other municipal facilities decreased emissions by 43.3% from 31 $MTCO_2e$ in FY 2011 to 18 $MTCO_2e$ in FY 2016.

Municipal Emissions Overview

Electricity has consistently been the dominant emissions source within municipal operations (Figure 24). Even though total emissions decreased and total emissions from electricity decreased, electricity usage is still the largest contributor of greenhouse gas emissions from municipal operations. This can be turned into an advantage if the town significantly increases the renewable energy content of the electricity it uses. If more departments rely heavily on electricity and the electricity is sourced from carbon-free sources, emissions will continue to decrease. The share of emissions from gasoline and diesel both increased between FY 2011 and FY 2016 because of the increase in fuel usage between the inventory periods. As mentioned previously heating oil usage decreased dramatically between FY 2011 and FY 2016, and as a result heating oil is now responsible for less than 1% of the town's municipal emissions. Municipal departments have actively worked to move away from heating oil to natural gas, and the results are clear. The decrease in heating oil usage also partially explains the increase in proportion of emissions from other energy sources. For example, even if emissions from the remaining energy sources was constant, each would constitute a higher percentage of the total emissions.

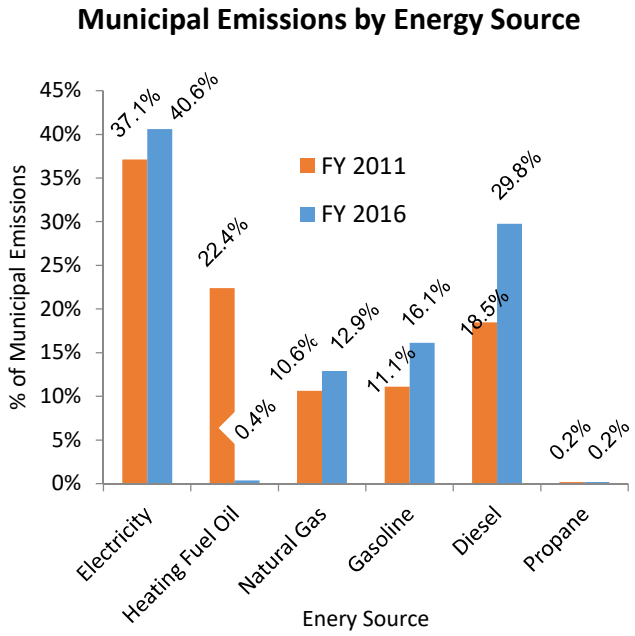

Figure 24. Percentage of Amherst's total municipal greenhouse gas emissions by energy source in FY 2011 (orange) and FY 2016 (blue).

Looking more closely at emissions from electricity usage throughout all municipal departments, schools, the water department, and the wastewater department are the largest electricity users in the town (Figure 25). Combined, they account for 71.9% of the municipal electricity emissions in FY 2016. The electricity emissions distribution follows the municipal buildings emissions distribution very closely, demonstrating that most departments rely on electricity to meet their energy needs. The non-municipal building town departments each contribute only small percentages to the total electricity usage emissions. Schools have already completed a LED lighting retrofit to reduce their electricity consumption. Treating drinking water and wastewater are inherently electrically intensive processes. Unless major changes or retrofits occur, these departments will likely continue to be top electricity users within municipal operations. While other departments may have a smaller contribution to the electricity related emissions it may be easier to reduce their electricity usages.

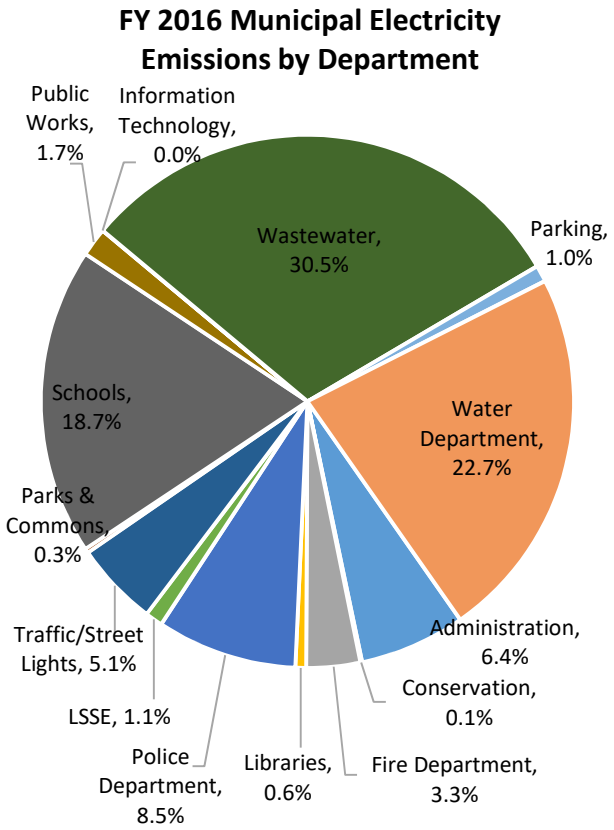

Figure 25. Percentage of Amherst's municipal greenhouse gas emissions from electricity usage by town department in FY 2016.

Municipal Forecasts

Similar to the community inventory, two projection forecasts were made for the municipal operations: a business as usual (BAU) scenario and adjusted business as usual (ABAU) scenario (Figure 26 and Figure 27). Like the community inventory, the BAU forecast assumes that the town does not take aggressive actions towards reducing the greenhouse gas emissions. Emission growth rates are estimated by the expected change in services provided by each town department. Town departments usually only plan potential changes in services up to five years in advance; therefore, most of the long term projections are based on general changes to the town such as population growth or employment growth. When applicable and long term planning information exists, department emission projections are based on unique growth

rates. Future fuel usages within each department are based on nationally projected changes in fuel consumption. Given how variable fuel usage between departments has been in previous years, future on-road vehicle emissions are perhaps subject to the most uncertainty. The municipal BAU forecast predicts that FY 2016 municipal operation emissions will increase by 4.2% to 4,575 $MTCO_2e$ in 2050.

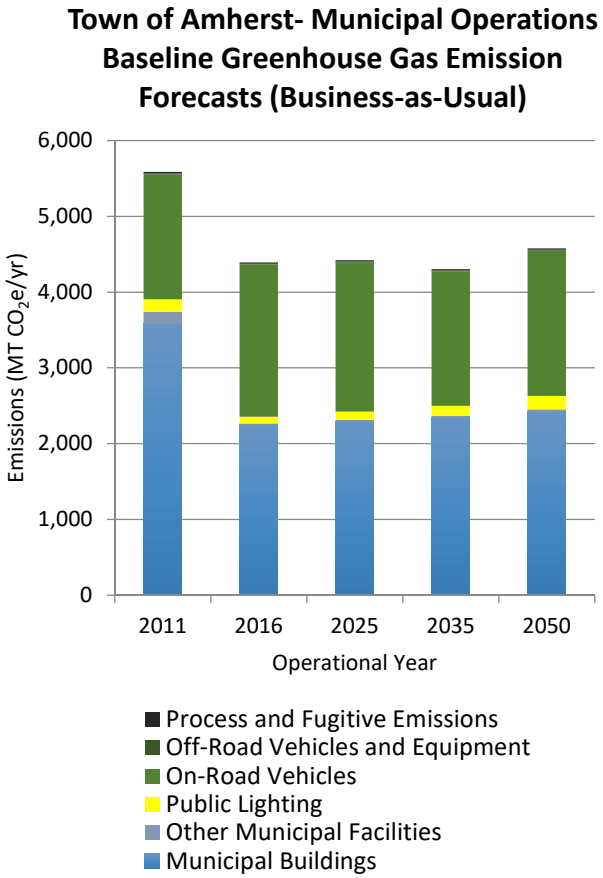

Figure 26. Amherst municipal business-as-usual greenhouse gas emission projections through 2050.

The municipal ABAU forecast predicts that FY 2016 emissions will decrease by 5.7% to 4,140 $MTCO_2e$ in 2050. The municipal ABAU forecast assumes the same changes in the carbon intensity of electricity as the community ABAU forecast. The ABAU does not account for more aggressive changes to the town's electricity source including the possibility of joining a community choice aggregation or developing local renewable energy projects. If either of these took place, emissions could decrease more than predicted given the share of electricity within the municipal operations energy mix. Given the difficulty in projecting possible changes for each department, the electricity source is the only significant difference between the BAU forecast and the ABAU forecast.

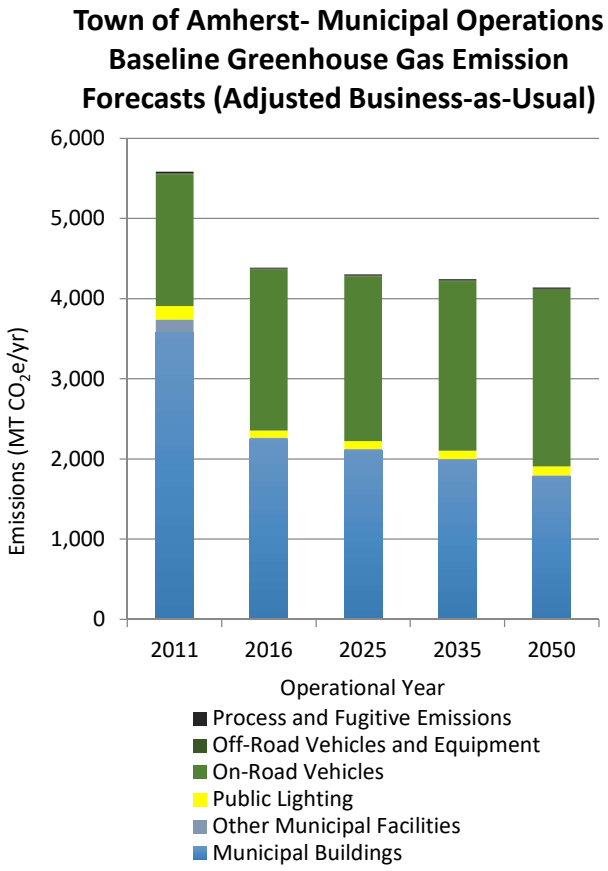

Figure 27. Amherst municipal adjusted business-as-usual greenhouse gas emission projections through 2050.

Conclusion

While the town has not set an official emission reduction goal it is likely that one will be established in the coming years. Even without a set target, the Town of Amherst has actively worked to reduce its energy usage and emissions. The efforts are noticeable in both the community inventory and municipal operations inventory. Based on the emissions breakdown by subsector (Figure 4), nearly half of the emissions come from the three

universities and the other half of the emissions come from residential buildings and other community sources. Relatively small percentages of emissions come from municipal operations and fugitive natural gas leaks.

Each university is autonomous, so Amherst has limited influence over the university operations. UMass and Hampshire College have both set carbon neutrality goals and Amherst should work to help them achieve their goals when possible. As shown in the ABAU projections, emissions would decrease significantly if the universities achieved their goals.

Amherst should focus on the residential buildings subsector and the community subsector, since the town can more easily influence these groups. Energy usage including electricity, natural gas, and heating oil use are the main emission sources in these subsectors. Amherst should continue engaging residents and local businesses to help reduce their energy usage through local renewable energy projects, fuel switching programs, and energy efficiency programs. Another strategy that would reduce emissions in all sectors would be to source greener electricity. Currently Amherst receives all of its electricity from the utility company. Amherst could consider alternative electricity sources including local renewable energy projects or participating in a Community Choice Aggregation (CCA) with a high renewable energy portfolio.

References

USEPA. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014*. USEPA, 2016, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014*, www.epa.gov/sites/production/files/2017-04/documents/us-ghg-inventory-2016-main-text.pdf.